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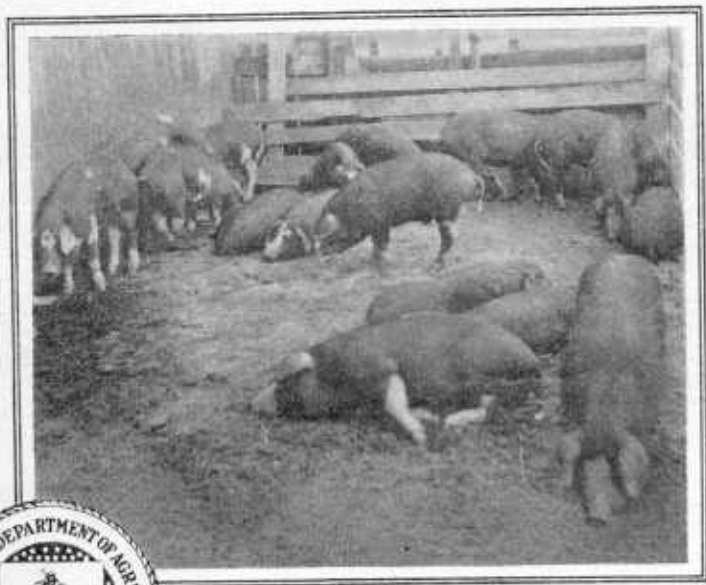
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# U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 834 *rev.*  
*May 1928*

Rev. ed.  
follows

# HOG CHOLERA



**H**OG CHOLERA destroys more hogs in the United States than all other diseases combined. The losses have amounted to more than 6,000,000 hogs in one year, and the money losses reach many millions of dollars yearly.

Many of the ways in which hog cholera is carried from farm to farm can be avoided by the exercise of proper care.

Sanitation, disinfection, and self-imposed quarantine are important.

The Federal Government and the State authorities aim to reduce losses to the minimum.

Cooperation by all concerned is essential to success.

The Bureau of Animal Industry has made a study of the disease and finally developed anti-hog-cholera serum, which is the only known reliable preventive agent.

Washington, D. C.

Issued August, 1917  
Revised May, 1928

# HOG CHOLERA<sup>1</sup>

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## PREVALENCE

**H**OG CHOLERA, the most serious disease of hogs, is found in practically all parts of the world. In this country it appeared first in 1833 in Ohio, and later spread to every State in the Union. It is most prevalent in the States of the Middle West and of the South, where hogs are raised in greatest numbers. The Pacific Coast States remained practically free from hog cholera until recent years, probably because of the limited production of hogs and their limited importation from the infected districts of the country.

In the South, where the winters are mild and the temperatures more or less uniform, severe outbreaks of hog cholera may occur at any season of the year, but statistics collected from experiments conducted in 14 States, principally in the Middle West, show that the disease reaches its greatest height during October and November. After this time it dies down rapidly, particularly after snow falls, and reaches its lowest point during February.

## LOSSES FROM HOG CHOLERA

While hog cholera has been present in this country continually for more than 50 years, it has been unusually prevalent in certain periods. The first period of exceptional prevalence reached its climax in 1887, the second in 1897, and the third apparently reached its height in 1913 and 1914. During these periods the hog-raising industry throughout the country suffered great losses and in some localities was for a time practically destroyed. Again in the fall of 1926 the disease became unusually prevalent, especially in the Middle West. Owing to the inadequate supply of serum to meet the unusual demand losses were heavy in some sections.

<sup>1</sup> The original edition of this bulletin, issued in August, 1917, was written by M. Dorset and O. B. Hess.

The value of hogs destroyed by cholera in the United States has amounted to about \$65,000,000 in a single year, and the average annual loss for a period of 40 years probably was not less than \$30,000,000. This represents merely the direct losses; if the indirect losses could be computed, these figures would be greatly increased. Table 1 gives the estimated numbers of hogs and losses from cholera, by States, for the years 1921 to 1924, inclusive.

The losses from hog cholera in the United States, by years, since 1895 are shown in Figure 1.

TABLE 1.—*Estimated number of hogs in each State on January 1 and losses from cholera, 1921-1924*<sup>1</sup>

State	1924		1923		1922		1921	
	Hogs on hand	Losses from cholera	Hogs on hand	Losses from cholera	Hogs on hand	Losses from cholera	Hogs on hand	Losses from cholera
Iowa.....	11,415,000	322,488	11,602,000	521,657	8,928,000	566,900	8,265,000	536,521
Illinois.....	5,625,000	166,963	5,750,000	257,664	4,425,000	187,720	4,835,000	284,029
Missouri.....	4,860,000	125,316	5,050,000	235,646	4,410,000	189,464	4,100,000	199,422
Nebraska.....	5,983,000	181,800	5,638,000	334,372	4,100,000	216,678	3,558,000	195,408
Indiana.....	3,550,000	118,177	3,500,000	198,656	3,100,000	213,304	3,700,000	250,403
Ohio.....	2,950,000	63,027	3,100,000	120,618	2,900,000	118,694	2,950,000	133,941
Kansas.....	2,747,000	37,770	2,990,000	90,592	2,392,000	71,066	1,947,000	66,559
Minnesota.....	3,830,000	87,248	3,650,000	139,840	2,900,000	108,576	2,600,000	98,559
Texas.....	1,600,000	22,205	1,880,000	44,173	2,190,000	55,824	2,330,000	191,149
South Dakota.....	3,000,000	100,354	3,100,000	177,317	2,200,000	105,931	1,913,000	128,250
Georgia.....	1,520,000	62,964	1,600,000	80,184	1,800,000	111,904	1,920,000	115,074
Wisconsin.....	1,900,000	22,774	1,960,000	32,122	1,680,000	37,260	1,710,000	40,313
Tennessee.....	1,340,000	23,990	1,654,000	38,444	1,546,000	50,282	1,594,000	55,656
Oklahoma.....	1,175,000	18,166	1,401,000	31,388	1,334,000	33,624	1,213,000	36,018
Kentucky.....	1,185,000	17,180	1,275,000	32,826	1,161,000	31,464	1,320,000	38,241
Alabama.....	1,049,000	21,432	1,261,000	38,333	1,307,000	36,893	1,347,000	58,815
North Carolina.....	1,020,000	44,000	1,100,000	44,506	1,186,000	44,739	1,246,000	45,288
Mississippi.....	900,000	20,400	1,040,000	37,408	1,180,000	33,796	1,195,000	32,913
Pennsylvania.....	950,000	15,904	1,020,000	21,331	1,060,000	28,800	1,100,000	30,861
Michigan.....	1,143,000	16,403	1,150,000	23,300	1,100,000	40,860	1,060,000	26,485
Arkansas.....	878,000	27,104	1,139,000	38,080	1,190,000	48,125	1,233,000	44,712
South Carolina.....	830,000	15,488	920,000	15,932	870,000	34,092	840,000	42,210
California.....	624,000	17,016	818,000	26,688	818,000	17,520	818,000	22,518
Virginia.....	678,000	11,981	714,000	18,340	729,000	17,107	828,000	23,184
Louisiana.....	580,000	18,080	650,000	31,920	700,000	51,408	749,000	51,030
Florida.....	640,000	36,480	727,000	48,128	757,000	28,120	832,000	35,888
New York.....	347,000	5,352	385,000	9,358	385,000	10,483	480,000	11,700
Colorado.....	575,000	6,710	592,000	9,947	455,000	9,623	414,000	12,285
North Dakota.....	738,000	11,720	590,000	16,145	460,000	11,089	455,000	9,004
West Virginia.....	212,000	4,176	230,000	6,220	255,000	6,320	269,000	6,593
Maryland.....	219,000	8,128	240,000	11,417	263,000	9,089	285,000	10,260
Idaho.....	400,000	6,800	320,000	6,048	260,000	3,706	220,000	3,528
Oregon.....	270,000	1,505	251,000	1,760	235,000	2,587	248,000	2,934
Washington.....	221,000	2,412	217,000	2,103	197,000	3,472	236,000	3,816
Montana.....	292,000	3,504	225,000	3,888	180,000	2,692	160,000	3,078
New Jersey.....	66,000	1,089	80,000	2,660	96,000	3,168	113,000	3,208
Utah.....	90,000	1,242	100,000	1,549	80,000	1,728	70,000	1,863
New Mexico.....	71,000	720	89,000	682	94,000	854	90,000	1,269
Wyoming.....	129,000	1,523	105,000	1,904	83,000	1,075	68,000	986
Massachusetts.....	65,000	880	64,000	1,200	65,000	1,440	75,000	2,052
Maine.....	60,000	655	59,000	1,520	61,000	1,088	73,000	1,055
Vermont.....	53,000	560	53,000	892	52,000	1,180	63,000	1,409
Arizona.....	24,000	384	38,000	319	37,000	684	40,000	2,395
Connecticut.....	21,000	224	30,000	667	38,000	1,008	45,000	1,058
Delaware.....	27,000	800	30,000	1,760	33,000	1,720	36,000	1,800
New Hampshire.....	18,000	224	26,000	421	28,000	582	31,000	577
Nevada.....	31,000	600	28,000	448	25,000	800	25,000	450
Rhode Island.....	6,000	128	8,000	106	10,000	240	12,000	281
United States.....	65,937,000	1,674,946	68,447,000	2,760,479	59,355,000	2,554,779	58,711,000	2,905,048

<sup>1</sup> Comparable figures for years subsequent to 1924 are not available.

## THE CAUSE OF HOG CHOLERA

Hog cholera is a highly contagious disease of swine, caused by a virus which is present in the blood, urine, feces, and secretions of the eye and nose of a hog affected with this disease. It is accompanied by fever, is highly fatal to hogs, but, so far as known, does not affect other animals, or man. It has been asserted by some that certain breeds of hogs are immune, but experiments have proved that all breeds of hogs are alike naturally susceptible to the disease, although there may be a considerable difference in the degree of susceptibility of different individuals.

The microorganism that causes the disease has never been cultivated artificially in laboratories, as many other infectious germs have. It can not be seen, even with the most powerful microscope; it passes readily through the pores of the finest filters, which will hold back all visible bacteria; and it is known only by the effects which it produces. In these respects it resembles the virus that causes foot-and-

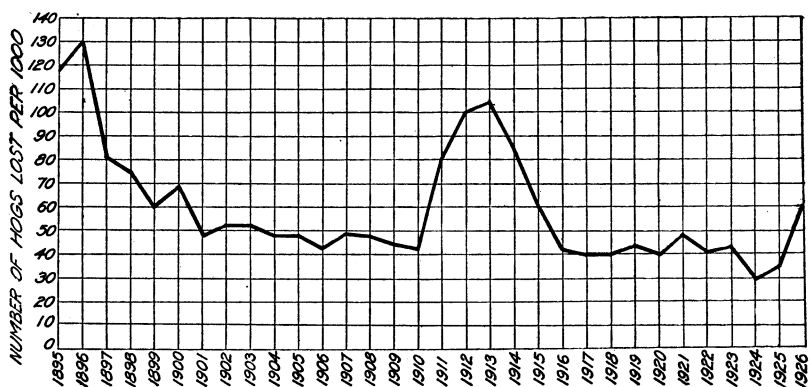


FIG. 1.—Losses from hog cholera in the United States from 1895 to 1926, inclusive

mouth disease and rinderpest in cattle. Although insanitary surroundings and improper feeding tend to lower vitality and may thus render animals less able to withstand the disease, such conditions can not of themselves cause hog cholera. It can be produced only by the specific microorganism of hog cholera.

## SYMPTOMS SHOWN BY HOGS SICK WITH CHOLERA

The symptoms of hog cholera differ in different hogs and in different herds, depending on the strength of the virus and the ability of the animals to withstand the disease. As a result of these variations the disease has been said to exist in two forms—acute and chronic. In the acute or severe type hogs sicken and die quickly. In the chronic or less severe type hogs may be sick for weeks or months before they succumb.

When cholera appears in a herd, all the hogs do not become sick at once, but, on the contrary, at first only one or two refuse to come up to feed with the herd. The sick ones remain hidden in the nest and when driven from the bed their backs may be arched, and they may appear cold and shiver. The rest of the herd may remain

apparently well for several days, when others are likely to be found affected in about the same way as those first attacked. As the disease progresses the sick hogs become gaunt or tucked up in the flank and have a weak, staggering gait, the weakness being most marked in the hind legs.

If the lungs are affected there may be a cough, which is particularly noticeable when the hogs are disturbed. The eyes usually are inflamed and show a whitish discharge, which may cause the lids to stick together.

Constipation, which is commonly present in the early days of the disease, is generally followed by a diarrhea. As the disease reaches its height red or purplish blotches may appear on the skin of the ears, of the belly, and of the inner surfaces of the legs.

Some of the symptoms mentioned may be present in other diseases, but the owner should remember that cholera spreads rapidly through a herd and no time should be lost in calling a veterinarian to diagnose the disease and administer the proper treatment. If the disease is cholera, heavy losses can be averted only by prompt immunization of the herd.

The temperature of the hogs is of much importance in diagnosing cholera. The normal temperature in ordinary weather, when the hogs are not excited or worried, ranges from 101° to 103° F., but when cholera is present it is not uncommon to find a large proportion of the hogs with temperatures from 104° to 107°, and even higher. The temperature may fall below normal in the late stage of the disease.

#### PERIOD OF INCUBATION

The true period of incubation is the time elapsing between the entrance of the virus into the body and the appearance of symptoms of the disease. In the tests conducted by the Bureau of Animal Industry, virus was injected into the bodies of susceptible shotes. Adopting the time of the appearance of visible symptoms as the end of the period of incubation, it was observed that the shortest period from the time the virus was injected until the appearance of visible symptoms was three days and the longest was seven days. In 95 per cent of the 171 shotes used in the experiment, the incubation period ended on the fourth, fifth, or sixth day. When susceptible swine are exposed by contact or other natural channels, it is impossible to know the exact time when infection occurs, but visible symptoms are rarely observed within less than five or six days after such exposure.

#### APPEARANCE OF A HOG AFTER DEATH FROM CHOLERA

An examination of carcasses of hogs that die assists in determining whether they have died of cholera, but it is desirable to kill a sick hog for autopsy if there is any doubt as to the diagnosis. It is important also that the condition of the entire herd be considered before making a diagnosis. In making a post-mortem examination, first place the carcass on its back and examine the skin for purple blotches resembling a birthmark. Then the carcass should be opened from the throat to the tail, exposing the internal organs without cutting them.

## LUNGS

In acute cholera the surfaces of the lungs frequently show small, red spots (petechiae) varying in size from that of a pinhead to that of a small pea. These spots can not be washed off, and when found are an important indication of cholera. It is not unusual, instead of finding the lungs soft, filled with air, and pinkish in color, as is the case in a normal condition, to find portions of them solid and of a grayish or dark-red color, which results from a form of pneumonia. This condition, however, is not so characteristic of hog cholera as the reddish spots mentioned.

## HEART

When removed from the membranous sac surrounding it the surface of the heart may show blotches or blood spots such as those on the lungs. They are usually seen only in the acute form of hog cholera and are not always present.

## LIVER

The liver generally shows no changes that can be regarded as characteristic of cholera.

## SPLEEN, OR MELT

In acute cases of hog cholera the spleen, or melt, is often large, dark, and soft. In chronic cases, however, it may be smaller than normal and grayish in color.

## KIDNEYS

The kidneys are surrounded by a thin, fibrous tissue. This should be peeled off carefully to avoid injury to the surface of the kidney and an examination made for dark-red spots (petechiae) varying in size from mere points to areas as large as the head of a pin. The spots may be few, or the surface of the kidneys may be as speckled as a turkey's egg. These spots on the kidneys are very commonly present in acute cases of hog cholera. (Fig. 2.)

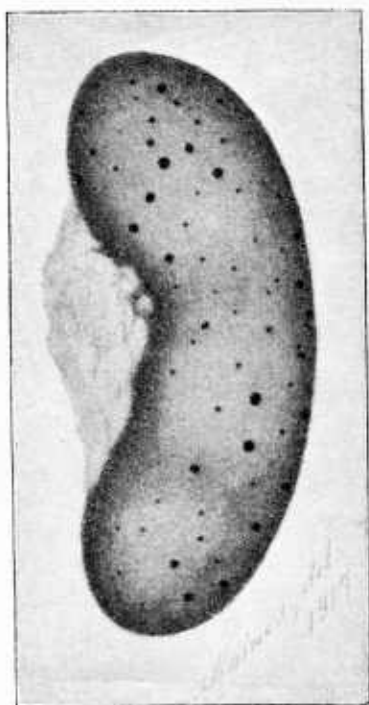


FIG. 2.—Hog's kidney, showing blood spots caused by cholera

## BLADDER

The inner surface of the bladder under normal conditions is white or a faint pinkish white in color, but in well-marked cases of hog cholera it may show bright-red specks which can not be washed off. In cases of long standing there may be ulcers.



## STOMACH

In some cases of hog cholera, when the stomach is opened and washed out, red spots and ulcerations may be found on the inner surface.

## SMALL INTESTINES

In some acute and virulent types of hog cholera the outer surface of the small intestines may have the appearance of being spattered with blood. The bloody spots, however, can not be removed by washing. The inner lining may be congested, inflamed, greatly thickened, and covered with a yellowish coating; or it may be dotted with small blood spots like those seen on the outer surface.

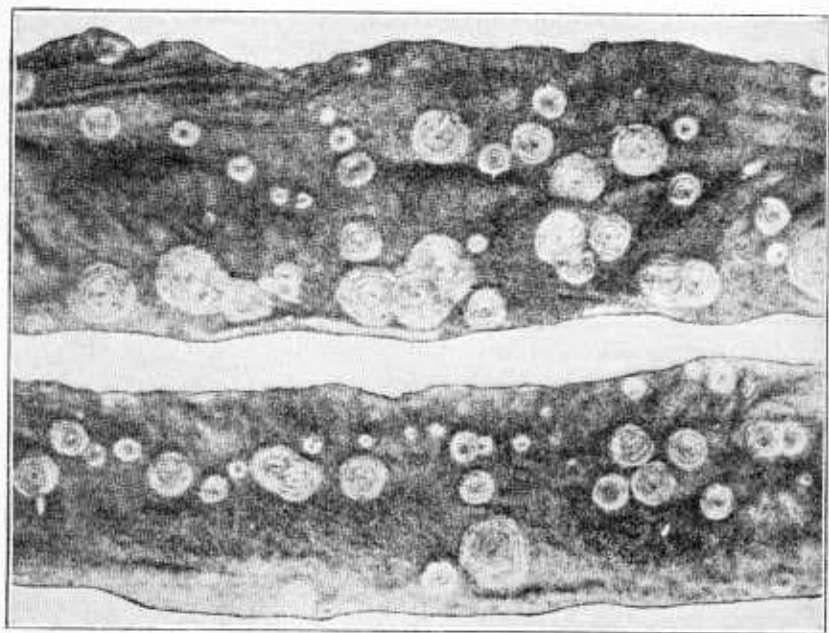


FIG. 3.—Intestine of cholera hog, showing ulcers. (After Hutyra and Marek)

## LARGE INTESTINES

The large intestines may show, over the outer surface, the same characteristic blood spots as are seen at times on the small intestines. The inner surface in acute cases of hog cholera also may show small, blood-stained areas, and in addition to this the feces found in this portion of the bowel may be streaked with blood.

In chronic cases, where the hog has been sick for some time, there are usually found on the inner surface of the large intestines, especially in the region of the ileocecal valve, round, hard areas called "button ulcers." (Fig. 3.) These ulcers are raised above the surrounding tissue and usually are yellowish in color, while the larger ones may have dark centers. The ulcers vary in size from one-sixteenth of an inch to 1 inch in diameter. They must not be confused with the lesions of necrotic enteritis.

## LYMPHATIC GLANDS

The changes which take place in the lymphatic glands as a result of hog cholera frequently are striking. The most important glands to be examined are found in the fat just under the skin of the belly, in the region of the flanks. In health these glands are of a rather light-grayish color; in cases of cholera they may be enlarged and red, and in severe cases they may appear almost black. If cut through with a knife, it will be found generally that the outer portion or rind of the gland is affected to the greatest extent. Other lymphatic glands which undergo similar changes are found in the fatty tissues at the angle of the lower jaw and in the thin membrane which holds the intestines together.

## BONES

The bones are congested, as may be seen by cutting through the breast bone.

Any or all of the changes which have been described may be found in a hog which has died from hog cholera, but it is rare to find all in any one case. In the lingering or chronic cases of hog cholera it is usual to find the intestinal, button-like ulcers, while the blood-colored spots described are, as a rule, found in the acute cases. Often more than one post-mortem is necessary in making a diagnosis.

## DISEASES WHICH MAY BE MISTAKEN FOR HOG CHOLERA

It is difficult for even trained and experienced veterinarians to differentiate hog cholera from some other diseases and conditions that affect swine. Furthermore, cholera is often found complicated with other diseases or conditions.

Among the diseases and conditions which should be considered when making a diagnosis are the following:

## HOG "FLU" (INFECTIOUS BRONCHITIS, SWINE INFLUENZA)

Hog "flu" is a herd disease, usually attacking all or most of the animals in the herd at the same time, which is not the case in outbreaks of cholera. There is sudden prostration and loss of appetite. Spasmodic breathing, or "thumps," is usually observed. When forced to move, the affected animals have violent fits of coughing and often attempt to vomit. The mucous membranes of the eyes are red, and the eyes show a watery discharge. There may be a discharge from the nose, often streaked with blood. The temperatures in the height of typical outbreaks range from 104° to 108° F. If the animals are given proper care the disease is of short duration, and the losses are not heavy.

## ANTHRAX

Hogs rarely are affected with anthrax, but when this disease does occur it may readily be mistaken for the acute type of hog cholera. One of the distinguishing features of anthrax in hogs is the marked swelling of the throat and tongue, with frequently a bloodstained, frothy discharge from the mouth. Anthrax in hogs usually follows the disease in other animals on the farm, such as cattle, sheep, and horses, which are more susceptible than hogs.

## NECROTIC ENTERITIS

Necrotic enteritis causes marked unthriftiness and is often fatal. There is usually a lack of appetite, and diarrhea. The pigs become emaciated and weak. The lesions of this disease most commonly affect the inner lining of the large intestines, but in advanced cases the lining of the small intestines also is involved. Small, white, well-defined areas may be seen through the outer covering of the large intestines, and on splitting the intestine open the inner lining is found to be thickened, and studded with white, dead patches ready to slough off, but they do not form characteristic, button-like ulcers, as in chronic cholera. In advanced cases patches of the inner lining of the intestine can be scraped away with the thumb nail. Under these conditions the animal rapidly wastes away and dies. The absence of red spots on the belly, the lack of fever, the slow development of the disease in the herd, and the fact that it is confined principally to pigs and shotes, all serve to distinguish this disease from cholera.

## PNEUMONIA AND PLEURISY (SWINE PLAGUE)

There is much similarity between the symptoms of pneumonia and of cholera in swine. Many cases of cholera are accompanied with more or less solidification of the lungs. There is loss of appetite, disinclination to move, fast breathing and elevation of temperature in both diseases. Usually in pneumonia comparatively few of the animals are sick at the same time. The temperatures of the sick hogs rarely exceed 104° F., while in cholera they generally are much higher; however, some hogs in the advanced stage of cholera show normal and even subnormal temperatures. Hogs suffering with pneumonia show a tendency to lie on their breasts to facilitate breathing. Death does not occur so quickly as in cholera. Small, red spots on internal organs and purple discoloration of the skin covering the ears and abdomen are common lesions found in cholera but not in pneumonia.

The symptoms of pleurisy are similar to those of pneumonia. Great skill is required to differentiate hog cholera from either pneumonia or pleurisy.

## SCOURS OR DIARRHEA IN SUCKLING PIGS

Apparently there is no single cause for scours in suckling pigs, nor are the lesions constant. A post-mortem examination may reveal evidence of irritation in the inner lining of the intestines, and there may be ulceration, but the characteristic lesions of cholera are not found.

## WORMS

Growing pigs often suffer from infestation with worms, both in the lungs and in the intestines, but old hogs rarely show the effect of such infestation. The most important symptom produced by worms is general unthriftiness.

The worms that commonly infest the lungs (lungworms) are very small, usually half an inch to 2 inches in length; they often produce a bronchitis which causes coughing and may result in pneumonia. They may be found in the fluid obtained by squeezing the freshly cut surfaces of the lungs after death.

The worms (roundworms) that infest the intestines vary in size, some attaining a length of 18 inches. These parasites impair the general health of the pigs and by irritation of the alimentary tract may cause diarrhea. Moreover, in the course of their life cycle, the larvæ of these worms migrate through the liver and lungs before they settle down in the intestines. If many larvæ go through the lungs at the same time, they injure that organ producing numerous minute hemorrhagic spots. Young pigs are especially susceptible to the invasion of the lungs by the larvæ of this roundworm; they often develop pneumonia, which may terminate fatally.

While a large proportion of the pigs and shotes in a herd may become affected with various species of worms and act in somewhat the same way as those attacked by hog cholera, the fact that there is no fever and that the ailment does not seriously affect grown hogs is of material assistance in distinguishing this trouble from hog cholera.

It is advisable to obtain the services of a competent veterinarian immediately when disease appears in the herd in order to avoid mistakes in diagnosing the malady and to save time in applying the proper treatment.

#### MODES OF INFECTION IN HOG CHOLERA

Hog cholera does not occur in a herd except through the introduction of the specific microorganisms of that disease. So far as known, the virus of hog cholera develops and propagates only in the bodies of hogs. There is no more certain way of introducing hog cholera than by placing in the herd a hog already infected with the disease. A sick hog, then, must be regarded as the most dangerous agent in the spread of cholera. Hogs affected with cholera discharge the virus of the disease from their bodies in the urine, the feces, and the secretions of the nose and eyes. Therefore the manure, bedding, litter of all sorts, and the dirt in pens where sick hogs are kept are contaminated with the virus of the disease. It may enter the hog's system by means of food or drink and probably also through wounds or abrasions of the skin.

The shipment, to market, of hogs affected with cholera has resulted in the infection of public stockyards, unloading chutes, and railroad cars used for hauling hogs. Consequently if healthy hogs are shipped in ordinary stock cars, or if they are unloaded in public stockyards or through public chutes, they are likely to become infected with cholera. Any agency which will serve to carry infected litter, manure, or material of any sort from public stockyards or cars to farms may result in an outbreak of cholera on the farm. Such infected material may adhere to the feet of horses or other stock, to wagon wheels, or to the shoes of men who have entered these places.

What is true of public stockyards and stock cars is true of farms where cholera exists, and it may be expected that the disease will be carried from an infected farm to healthy herds if preventive measures are not taken. Streams passing through infected farms may carry the virus to other farms. If the carcasses of dead animals have not been disposed of promptly and properly, dogs may carry portions to neighboring farms. At certain seasons it is common for farmers to exchange labor and farm implements, when

threshing, shelling corn, filling silos, and delivering grain or stock to market. Unless proper precautions are taken, these practices may serve to spread cholera. It has been said that cholera has been traced in some instances to the visits of stock buyers and venders of stock remedies who go from farm to farm.

If hogs on a clean farm are not kept in lots properly fenced, they may range to contaminated streams or to adjoining herds and thus contract and spread cholera. It is undoubtedly true that infection in many cases results from the purchase of new stock, and at times from the borrowing and lending of stock for breeding purposes. There are records of many herds having become infected from the purchase of stock at public sales on farms where the disease existed. Some outbreaks have been reported to be caused by failure to take proper precautions when taking animals to be bred on premises where sires were kept for public service. It has been common for cholera to appear in herds fed on garbage. Outbreaks are no doubt caused, in many instances, by infection in scraps of uncooked pork and bones deposited in the garbage pail.

Farms on which hog cholera has occurred may remain infected for a considerable time, and a second outbreak may occur as a result of this harbored infection.

#### KEEPING CHOLERA OFF THE FARM BY SANITATION

From what has been said it will be seen that hog cholera may be spread in many ways, and that by proper foresight and the exercise of all possible care on the part of hog raisers the sources of danger may be reduced greatly if not entirely eliminated. With the object of assisting the farmer to protect himself, the following suggestions are offered:

Streams running through hog lots are valuable as sources of water supply, but they may be carriers of infection; therefore, swine confined to lots or pastures with streams running through them should be immunized against hog cholera.

Hog houses, lots, and pastures should be situated away from public highways, and the houses should be arranged so that they may be readily cleaned and disinfected. They should be exposed, so far as possible, to sunlight, which helps to disinfect. (Fig. 4.) Hog lots should not be used for yarding wagons and farm implements and should not be entered with teams and wagons, particularly those returning from stockyards and public highways. Strangers should be excluded from hog lots unless there is reasonable assurance that they have not recently been where there is infection. Farmers and their help should disinfect<sup>2</sup> their shoes and change their outer clothing before entering hog lots after returning from public stockyards, sales, and neighboring farms where infection is known to exist.

Mud wallows and cesspools should be drained, filled, or fenced in. If a wallow is to be used, it should be made of concrete and so designed as to be drained and cleaned easily.

<sup>2</sup> Compound cresol solution (U. S. P.), or a suitable substitute therefor, is a satisfactory disinfectant for use against hog cholera. A substitute for compound solution of cresol (see B. A. I. Order 309, p. 3) is called "saponified cresol solution." Both products contain 50 per cent of cresol. They are used in 3 per cent solution. This solution is made by adding 4 fluid ounces of the concentrated disinfectant to 1 gallon of soft water.

Runs, underneath buildings, which can not be readily cleaned and disinfected, should be closed. Straw stacks that have been used as nesting places by sick hogs should be burned or removed to a field and plowed under. It is a dangerous practice to leave remnants of stacks accessible to hogs from year to year, and new tenants should beware of this source of danger.

Hogs that do not recover fully from cholera should be destroyed, as they remain a constant danger.

Uncooked garbage or table scraps containing meat or bones should not be fed to hogs which have not been immunized against hog cholera.

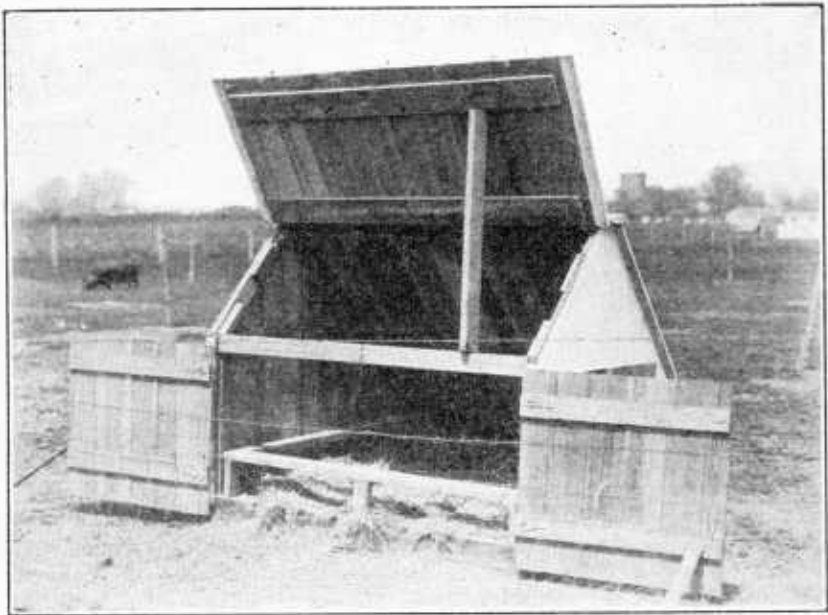


FIG. 4.—A sanitary individual hog house

All animals that die on the farm, as well as the entrails removed from animals at butchering time, should be properly disposed of by burning or burying. Unless disposed of in this way they will attract dogs or other animals which may carry the infection of hog cholera, tuberculosis, or other diseases to susceptible animals in the neighborhood.

Newly purchased animals are potential sources of danger. Therefore, newly purchased stock, stock borrowed or lent for breeding purposes, and stock exhibited at public fairs should be placed in isolated pens and kept there for at least 21 days or longer before being allowed to mingle with the herd. During the quarantine those who feed and care for the new stock should use care to prevent carrying possible infection from these pens to other swine on the premises.

If hog cholera appears on a farm the owner should voluntarily post a notice at the entrance to the premises reading **HOG CHOLERA—KEEP OUT**, and all neighbors should be warned so that they may protect their herds. The infected herd should be confined to limited quarters that can be cleaned and disinfected frequently during the presence of the disease.

Dogs should not be allowed to run about in a community when hog cholera exists.

Strict application of sanitation, proper foresight, and the exercise of all possible care by hog raisers would no doubt help to reduce losses from hog cholera.

The difficulty is in getting all hog owners to take the necessary precautions.

### PREVENTION BY IMMUNIZATION

#### ANTI-HOG-CHOLERA SERUM

This serum is prepared from the blood of hogs that have been hyperimmunized against hog cholera. Hogs that are immune against this disease, either naturally, as a result of exposure to infection, or as a result of inoculation, are injected with large quantities of blood from hogs sick with cholera. The blood from sick hogs, even in minute quantities, will kill susceptible pigs but does not injure immunes; on the contrary, it causes immunes to become more highly immune. After the immunes are injected with virulent blood they are called "hyperimmunes." About 10 days or 2 weeks after an immune hog has been hyperimmunized its blood contains a large amount of protective substance called antibodies, and it is from such blood that anti-hog-cholera serum is prepared. At present there are two kinds of serum on the market. One is commonly called "bloody serum," because it is red and cloudy, like blood. The other is called "clear serum." This clear serum is merely the bloody serum from which the red blood cells have been removed. Either form should be effective in protecting hogs from cholera if properly administered in proper doses. It is believed that clear serum is in some respects preferable to bloody serum, and the cost is not materially greater.<sup>3</sup>

The fact that a serum, made in the manner described, will protect hogs from cholera was first brought to the attention of the authorities in the various States by the Bureau of Animal Industry in 1908-9. Following this, several State institutions began the preparation and distribution of the serum, and subsequently its manufacture was taken up by private concerns. The efficacy of the serum is now recognized generally in the United States and in foreign countries.

While this serum is regarded as most efficacious when administered as a preventive, it seems to have some curative value, provided it is administered when hogs are in the very early stages of the disease. But very little benefit can be expected from the treatment of hogs that are visibly sick. Serum is a preventive rather than a curative agent.

Beginning in 1913 the Bureau of Animal Industry conducted experiments in 17 counties in 15 different States to determine the possibility of reducing losses from hog cholera by a systematic campaign

<sup>3</sup> See Circular No. 11, U. S. Department of Agriculture, Comparative Value of Types of Anti-Hog-Cholera Serum.

embracing limited quarantine, sanitary measures, and the use of the preventive-serum treatment. In the course of these experiments 234,136 hogs were treated in infected herds, with a loss of 13.1 per cent, notwithstanding the fact that 85,547 or 36.5 per cent of the number showed high temperatures from disease or other causes at the time of treatment.

During the same period 19,208 hogs were treated in uninfected herds for protection, with a total loss, from all causes, of only 49 hogs, or one-fifth of 1 per cent. Most if not all of the deaths reported probably were due to causes other than cholera.

#### HOG-CHOLERA VIRUS

Hog-cholera virus is prepared from the blood of pigs that are sick with hog cholera. Their blood is defibrinated and mixed with a preservative to make whole-blood virus.



FIG. 5.—Veterinarian getting equipment ready for treating herd

#### METHOD OF ADMINISTERING SERUM

Two systems are used in protecting hogs from cholera by inoculation—the serum-alone inoculation and the simultaneous inoculation.

Before beginning the treatment of an infected herd the sick and the apparently well hogs should be separated and each lot confined in a pen or inclosure that may be cleaned and disinfected. A catch pen, large enough to hold 8 or 10 pigs, should be made by placing a short gate across one corner of the inclosure nearest the operator. This will prevent worrying or exciting the whole herd. Otherwise the animals may run about and crowd together, thus causing an elevation of temperature that may be misleading, especially in warm weather. It is advisable to withhold feed from all hogs in the herd for at least 12 hours before treatment, but they should be given all



the water they will drink. Excitement of the herd during treatment is lessened by scattering shelled corn among the hogs.

An ample supply of hot water and clean pails should be on hand for preparing disinfectants and for use in keeping the instruments and the operator's hands clean.

The previously cleaned syringes and needles should be sterilized by boiling for 5 or 10 minutes before they are used. A table or bench, covered with clean towels, should be provided for the syringes and other instruments, and there should be a bucket containing a disinfectant<sup>4</sup> for rinsing the hands of the operator. (Fig. 5.)

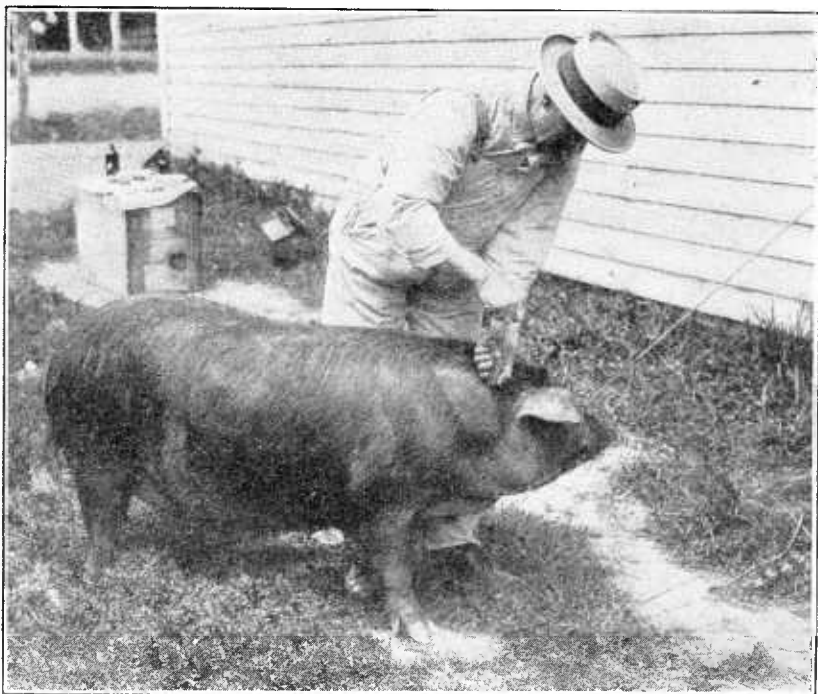


FIG. 6.—Injection back of ear

Serum and virus should be drawn from the original containers directly into the syringes. The serum should be about the normal body temperature when injected, but care must be taken not to exceed that temperature and not to maintain it for longer than a few minutes.

The needle should be removed from the syringe after each injection and placed in a small, shallow receptacle containing a disinfectant. A clean needle should be used each time an injection is made. Separate needles should be used for serum and virus. Needles should be of the smallest caliber that will conduct, without clogging, the product to be injected. If the nozzle of the syringe becomes soiled, it should be washed thoroughly with a disinfectant before further

<sup>4</sup> See footnote 2.

usc. Cleanliness reduces the possibility of abscesses and blood poisoning.

Sufficient help should be provided to hold the hogs in proper position for treatment. Hogs that are too heavy to handle in any other way may be snared by the upper jaw and held as shown in Figure 6. In such cases the injection is made in the fold of loose skin in the front of the shoulder back of the ear. Hogs of ordinary size may be handled conveniently in a V-shaped trough or on a small platform elevated to a convenient height from the floor. This places the hog in a desirable position for making the injection between the foreleg and the body as shown in Figure 7. Small pigs and shotes up to 75 or 80 pounds may be held up by the hind legs with the forefeet resting on the ground, and the injection made beneath the skin into the loose tissues of the flank, as shown in Figure 8. Injection into the abdominal cavity seems to be gaining favor among veterinarians. (Fig. 9.) This is the most convenient way of handling a small pig, as it may be held by one man and is in a suitable position for taking the temperature, cleansing the areas of operation, and making the injection.

Injection into the ham should be avoided, as abscesses which damage the ham may develop as a result of the injection. Cases have been reported in which such abscesses were not discovered until the ham was cooked and cut for use.

The temperatures of all hogs should be taken and recorded immediately before they are treated. Those showing temperatures of 104° F. or higher should be marked, if treated, so that they may be identified, as the treatment of animals with such high temperatures from cholera does not promise very satisfactory results. Hogs may be marked conveniently by placing a ring in the upper border of one ear.

It is an injustice to the operator, to the owner of the herd, and to the serum producer to administer serum to hogs without at the same time taking and recording the temperatures. It is not uncommon to find a herd which appears to be perfectly healthy, although at the time a large percentage of the animals may have a high fever. If such herds are treated without knowledge of this condition, the owner may be led to condemn unjustly the treatment or the man who applied it, for some losses are likely to occur, particularly if the temperatures do not warn the operator beforehand of the need for large doses of serum. On the other hand, if the temperatures are taken, the operator knows how to regulate the doses of serum.



FIG. 7.—Injection between foreleg and body (axillary space)

Before the administration of serum or virus the skin covering the point of injection should be cleaned thoroughly and washed with a disinfectant or painted with tincture of iodine. The skin is then drawn slightly to one side, the needle inserted to the desired depth, the injection made slowly, the needle withdrawn very gradually, and the needle wound pinched between the thumb and finger to prevent leakage. Not more than 10 cubic centimeters of serum in the case of pigs, nor more than from 20 to 30 cubic centimeters in the case of



FIG. 8.—Flank injection

larger animals, should be injected into one place, unless the injection is made into the abdominal cavity.

The virus should be injected on the opposite side of the body or at least some distance from the serum.

Serum should be used with the understanding that it is a preventive rather than a curative agent. Hogs in an advanced stage of the disease should be destroyed, as they spread the infection and rarely make a good recovery.

## SERUM-ALONE IMMUNIZATION

The serum-alone inoculation consists merely in injecting the serum which is obtained from hyperimmunized hogs. The serum may be used either to immunize healthy hogs or to treat those that are in

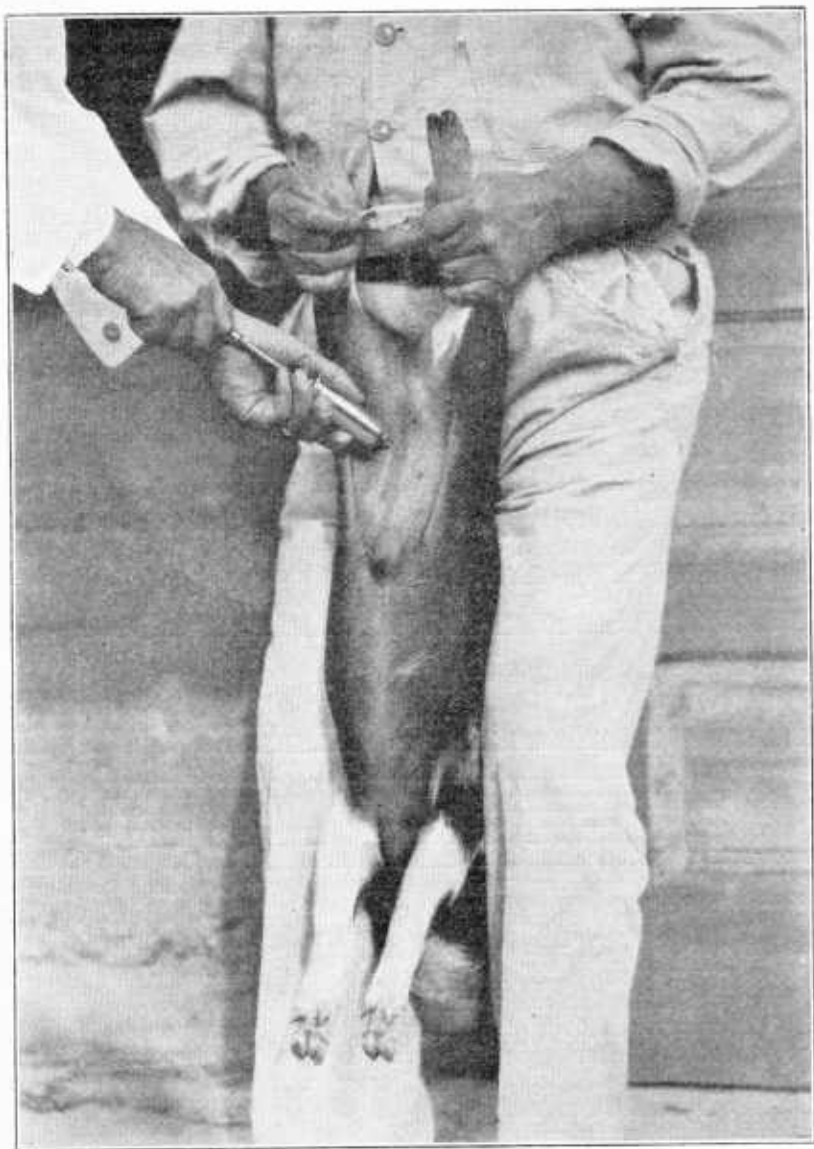


FIG. 9.—Injection into the abdominal cavity

the early stages of the disease. Good serum, properly administered, is incapable of causing hog cholera, as it does not contain the germs of the disease.

Unfortunately serum alone does not produce a permanent immunity against hog cholera. The length of protection which follows the injection of serum alone seems to depend to a certain extent on the peculiarities of individual hogs, which can not be determined beforehand, and also to some extent on the dose of serum. Certain experiments have indicated that the immunity lasts somewhat longer in hogs which receive exceptionally large doses. Ordinarily a farmer may count on the immunity lasting from two to six weeks following the treatment of healthy hogs with serum alone, but in some cases it lasts for two or three months. At times, when healthy hogs are treated with serum alone and shortly thereafter exposed to cholera, they seem to acquire a permanent immunity, but this is not always the case. Serum alone can not be depended on to produce a lasting immunity even though the treated pigs are promptly exposed to cholera.

It has been stated that serum alone has some value in treating sick hogs. This is true within certain limitations. Ordinarily it is of some benefit only in the very early stage of the disease, before the hog shows visible signs of sickness.

#### DOSE OF SERUM ALONE

The quantity of serum required for producing immunity is influenced by a number of conditions, chief among these being the condition and susceptibility of the pigs and the potency of the serum used. No hard-and-fast rule can be laid down, but as a general guide the doses in Table 2 are suggested.

TABLE 2.—*Usual doses of serum in the serum-alone treatment of healthy hogs*

Weight of animal	Dose of serum (cubic centimeters)
Suckling pigs <sup>1</sup> .....	20
Pigs 20 to 40 pounds.....	20-30
Pigs 40 to 90 pounds.....	30-45
Pigs 90 to 150 pounds.....	45-60
Hogs 150 to 200 pounds.....	60-75

<sup>1</sup> The dose of serum for very young sucklings may be less than that given in the table, but in no case should less than 10 cubic centimeters be given.

On account of the short period of immunity conferred by the serum-alone treatment, it is recommended only when for some reason the simultaneous inoculation is not suitable or when only a temporary immunity is required. It is suitable, for instance, for sows in advanced pregnancy, or when in emergency it is necessary to immunize pigs affected by a condition or disease other than cholera which has lowered their vitality so that they are not in fit condition to receive virus, or when an owner insists that a very sick hog be treated.

Some veterinarians, when treating suckling pigs, prefer to give a preliminary injection of serum alone, followed in a few weeks by the injection of serum and virus.

It is emphasized that the serum alone confers only a very temporary immunity. To obtain permanent protection it must be followed by the simultaneous treatment.

#### SIMULTANEOUS INOCULATION

In the simultaneous method of inoculation hog-cholera virus is used in addition to the serum. The theory of the simultaneous inoculation is to administer the virus and at the same time give a dose of serum which will protect the hogs from cholera. The virus enters the system of the hog and causes a reaction which results in establishing an immunity similar to that which is produced in hogs that recover from a natural attack of the disease. The serum prevents death or serious sickness which otherwise would be caused by the virus, and through the combined action of these two agents the hogs acquire immunity against cholera. There are many cases on record in which the immunity lasted several years.

Experiments show that unless the treated hogs become visibly sick, they do not transmit the disease to susceptible animals with which they mingle, but as a precaution the treated hogs should be segregated for at least three weeks.

#### DOSAGE OF SERUM AND VIRUS

The virus, of course, is given in very small doses as compared with the serum. The usual doses of virus and serum for simultaneous inoculation are indicated in Table 3.

TABLE 3.—*Usual doses of serum and virus in simultaneous inoculation of healthy hogs*

Weight of animal	Usual dose of serum (cubic centimeters)	Usual dose of virus
Suckling pigs <sup>1</sup> .....	20	At least 2 cubic centimeters of virus should be administered to each animal except in the case of sucklings, when the dose may be reduced. <sup>1</sup>
Pigs 20 to 40 pounds.....	20-30	
Pigs 40 to 90 pounds.....	30-45	
Pigs 90 to 150 pounds.....	45-60	
Hogs 150 to 200 pounds.....	60-75	

<sup>1</sup> In simultaneous inoculation of very young sucklings the doses of both serum and virus may be reduced below that given in this table, but the minimum doses should probably never be less than 10 cubic centimeters of serum and  $\frac{1}{2}$  cubic centimeter of virus.

If the herd is infected the dose of serum should be slightly increased for all apparently healthy hogs, and all those showing high temperatures or other evidence of disease should receive at least a dose and a half of serum. Many veterinarians make it a practice to administer from 10 to 25 per cent more serum than is specified in the dosage table. They also administer regularly from 3 to 5 cubic centimeters of virus, which will do no harm if a sufficient dose of good serum is given at the same time.

While the serum alone has the advantage of being harmless, it should be remembered that it has the disadvantage of producing only a transitory immunity. The conditions are precisely reversed

in the case of the simultaneous inoculation. In this case the immunity is prolonged, and it is rare to find a hog, immunized properly by the simultaneous method, which has again become susceptible to cholera.

The principal objection to the simultaneous inoculation is the element of danger caused by the injection of the virus of cholera. If the serum should not be of proper potency or sufficient doses are not administered, if the hogs are not in proper condition to receive virus, if the hogs do not receive proper care after treatment, or if the work is not done properly, hog cholera may be produced. Sufficient work, however, has been done to show that the simultaneous inoculation can be administered with safety. Certain important things, however, are to be remembered in this connection. Use good serum and give plenty of serum and virus. Enough serum should be given to prevent any signs of sickness in the treated hogs. To get a lasting immunity it is not necessary to render the hogs visibly sick from the injection. Apparently just as firm immunity is obtained when hogs show no symptoms of illness as when they are made sick by the injection. This treatment should be handled carefully, and those who have studied the question agree that the simultaneous inoculation should be administered only by competent veterinarians.

The prolonged immunity caused by the simultaneous inoculation is much to be desired for several reasons. It prevents the recurrence of cholera in the treated hogs; it eliminates the additional expense of retreatment; and it affords a better opportunity to eliminate the germs of the disease from infected premises, thus removing a source of danger from the neighborhood.

It is of the greatest importance when applying the simultaneous inoculation to give an ample dose of serum. In no case will harm be done by increasing the dose prescribed on the bottle labels. It is much better to give more serum and save the treated pigs at an added cost of a few cents than to lose them through failure to give serum enough. In general, the dose of serum required in the simultaneous inoculation may be said to depend upon the age, weight, and condition of the animal, but the amount of serum required is not in direct proportion to the weight, for small pigs and shotes require larger doses in proportion to their weight than older animals, and in all classes of hogs which show high temperatures larger doses of serum should be given than when healthy hogs are being treated.

The syringe used for injecting the virus should be in perfect order, so that the quantity of virus desired is actually injected into and retained by each animal. If the virus should not be virulent, the effect of the treatment would be the same as if serum alone were administered.

## TREATMENT OF HERDS

### HEALTHY HERDS

No definite rule can be laid down as to the necessity for treating healthy herds. In general it can be said that the necessity for the treatment of healthy herds depends on surrounding conditions, that is, the proximity of cholera and the ability of the farmer to protect his herd from the infection. It has been demonstrated that susceptible hogs may be kept within a few feet of cholera hogs without becom-

ing infected if sufficient care is taken to prevent the infection from being carried from the sick to the healthy animals. On the other hand, it has been noticed in practice that at times herds on farms immediately adjoining outbreaks of cholera may escape the disease, while herds several miles away become infected. It is probable that all the ways in which cholera spreads are not yet fully understood, but it is known that there are certain channels through which it frequently is carried from farm to farm, and cholera is produced only by conveying the infection in some way from sick hogs or infected premises to susceptible hogs.

Notwithstanding the fact that at times herds on farms adjoining those where there is an outbreak of cholera may escape the disease, it seems to be good practice for farmers to protect their herds by inoculation when cholera exists in the neighborhood, or if garbage or table refuse is fed. Many farmers make it a practice regularly to immunize their pigs at about weaning time or before.

The serum-alone treatment does not give immunity of sufficient duration to recommend it under such circumstances. As a general proposition, it appears to be better to use the simultaneous inoculation, provided it can be given by a competent veterinarian. After immunizing healthy herds in this way they should be kept segregated for at least three weeks. In case the disease appears in a herd after treatment, the hogs should be promptly treated again with serum alone, or, if the entire herd is not treated again, at least those animals showing high temperatures or visible symptoms of the disease should receive another injection of serum.

#### HERDS INFECTED WITH CHOLERA

In the field experiments conducted by the Bureau of Animal Industry during 1913, 1914, and 1915, it was the practice in some of the counties to use the serum-alone treatment exclusively, while in others all the apparently healthy hogs in diseased herds received the simultaneous inoculation, except those showing temperatures above 104° F., which received the serum alone. So far as the results of treatment are concerned, the losses from cholera were practically the same in the two sets of counties. However, in those counties where serum alone was used on all hogs, in diseased herds there was more or less recurrence of disease among the treated hogs. In other words, the healthy hogs in the diseased herds were protected for a short time but later lost their immunity, and since the infection was still on the farm, they then contracted cholera.

In the counties where the simultaneous inoculation was used on all apparently healthy hogs in infected herds, there were comparatively few cases of recurrence of disease, and where there were any recurrences they were among hogs which received the serum alone. In other words, some hogs supposed to be infected when treated and which, therefore, received serum alone, were probably not actually sick of cholera. They were protected for the time being, but later lost their immunity and contracted cholera from the infection which remained on the premises. In those herds in which the sick hogs received serum alone and the apparently healthy hogs received the simultaneous inoculation, the results would perhaps have been still better, so far as recurrence of disease is concerned, if hogs showing



temperatures above 104° F. had also been given the simultaneous inoculation.

#### OTHER DISEASED HERDS

Experiments indicate that hogs in normal condition usually withstand the simultaneous treatment without showing ill effects. It is unwise to administer virus to hogs while they are affected with hog "flu," pneumonia, necrotic enteritis, or other disease or condition which lowers their vitality. Apparently many of the "breaks" and consequent losses which occur soon after treatment are the results of administering virus when the animals are not in proper condition to receive it.

#### CARE OF HOGS AFTER TREATMENT

It is important that hogs should receive proper care after the treatment has been administered.

The grain ration should be restricted to not more than two-thirds of the usual quantity for two weeks after simultaneous treatment. It is not advisable to feed corn during this time. Shorts, middlings, bran, ground or soaked oats, crushed rye, barley, kafir, tannage, skim milk, and buttermilk are suitable feeds that may be used in formulating a proper diet. The best results are to be expected when the grain ration is reduced about three-fourths and at the same time the treated hogs are allowed to graze and exercise in a clean pasture in which there are no running streams or mud wallows. A plentiful supply of clean drinking water should be accessible constantly. The sleeping quarters should be kept clean, dry, and well bedded.

If it is necessary to keep the animals confined, their pens should be light, airy, dry, and should be kept clean and well bedded. The feed troughs should be kept clean, preferably by being scrubbed and scalded with hot water.

At the end of two weeks, if the animals are doing well, their diet may include some corn and be gradually increased to full feed.

#### BREAKS IN IMMUNITY

In comparatively rare instances the simultaneous inoculation of a healthy herd may result in infection among pigs. If such infection is caused by the treatment, symptoms of illness will usually be noted in the herd within 10 days of inoculation. The appearance of symptoms of disease at such a time after treatment of a healthy herd requires immediate attention from a veterinarian and usually immediate retreatment of the entire herd with serum alone. Such occurrences are frequently referred to as "serum breaks" because they may result from the use of a serum which is not of sufficient potency to protect against the virus which is injected with it, or perhaps through error the serum may not have been administered in sufficient dosage. It is thus evident that serum breaks may be in large part prevented by the administration of ample doses of potent serum.

The object should be always to prevent the appearance of sickness among the pigs that have been treated. It seems possible that such sickness may at times appear even though ample serum and virus have been given. This is believed to be due to the fact that

the herd is infected with some other disease at the time of treatment, as, for example, pneumonia, hog flu, or perhaps necrotic enteritis, or the fact that the herd has been subjected to unfavorable conditions, such as exposure to cold, or shipment by rail, or that proper care and feed were not provided after treatment.

"Late breaks," called also at times "virus breaks," constitute another form of trouble after simultaneous treatment. These are cases in which pigs have been immunized and have remained well after treatment, perhaps for several months, when they become sick with hog cholera. This shows a lack of immunity and is not always so easy to explain as are the early breaks. These late breaks may result from the fact that the virus was not potent enough to produce the necessary reactions in the treated pigs. These breaks may be prevented by using sufficient doses of good, potent virus.

In some cases these late breaks have occurred in herds which apparently were treated with good virus, although, of course, that fact can hardly ever be determined positively. There are some scientific data to show that swine, although properly immunized, may become temporarily susceptible to hog cholera because of other diseases. In other words, the immunized herd may contract a disease which in itself may not prove fatal, yet which, during the period of such infection, may put the animals in such condition that they are capable of contracting cholera, and if the herd happens to be exposed to it during such a period, they may experience late breaks. The proper procedure in the case of late breaks is immediate retreatment of the entire herd with ample doses of serum alone. The simultaneous inoculation may be given only when it is clearly established that the sickness among the hogs is caused by uncomplicated hog cholera.

#### EFFECT OF TREATMENT ON PREGNANT SOWS

The question frequently is raised as to the advisability of administering serum and virus, or even serum alone, to pregnant sows. Decision in this respect probably should be governed somewhat by the condition of the herd. If infection has already appeared, it is generally conceded that without treatment the loss will be from 80 to 85 per cent of the entire herd and that pregnant sows will probably abort, while sows that live through the disease will not breed until they have recovered fully. Therefore there can be no question as to the advisability of treating sows in infected herds, regardless of the stage of pregnancy. Even though there can be no hope of saving the litter, there is a possibility of saving the sows and of enabling them to recover more rapidly and in better condition than if they were not treated. It is considered advisable to avoid the simultaneous treatment of sows that are very near farrowing time. In such cases serum alone should be used, and followed later by the simultaneous inoculation.

The method of treatment for sows that are not near farrowing is a matter of choice, as the results, so far as abortion is concerned, are practically the same. Statistics on the subject are shown in Table 4.

TABLE 4.—*Observations following treatment of pregnant sows in infected and in healthy exposed herds*

Method of treatment	Sows treated	Sows aborting	
	Number	Number	Per cent
Infected herds:			
Serum alone.....	3, 235	261	8.0
Simultaneous.....	1, 357	98	7.2
Healthy exposed herds:			
Serum alone.....	126	2	1.5
Simultaneous.....	38	0	0

## EFFECT OF SIMULTANEOUS TREATMENT ON FERTILITY

In connection with the field experiments referred to, 2,362 healthy brood sows in 181 herds received the simultaneous inoculation, and 95 per cent of them produced pigs the following year. During the same time observations were made of 1,840 healthy sows, on 148 farms, that were not treated, and it was found that 94 per cent of these produced pigs the following year. (See Table 5.) From these

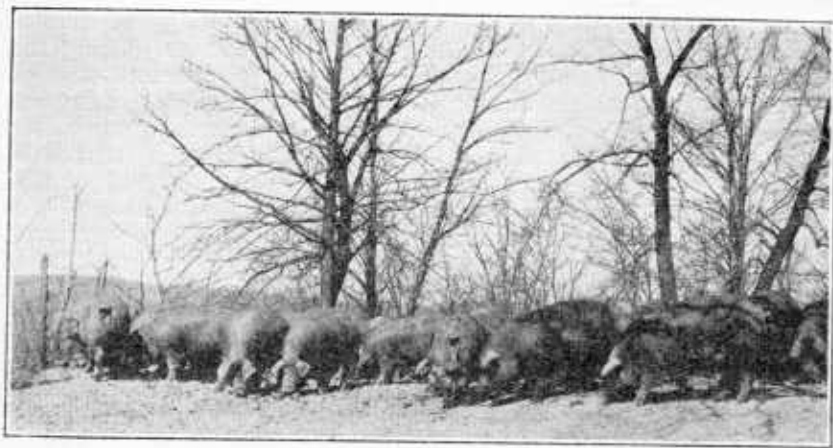


FIG. 10.—Portion of a herd of brood sows immunized by simultaneous inoculation. Figure 11 shows some of these sows with their litters the following spring

observations it is fair to conclude that the simultaneous method when properly applied to healthy brood sows does not produce sterility. (Figs. 10 and 11.) The very fact that hyperimmune sows—that is, sows that are used for serum production and have received enormous doses of hog-cholera virus—generally farrow normal litters confirms these observations.

TABLE 5.—*Summary of investigations as to effects of simultaneous treatment on fertility of brood sows*

Healthy brood sows	Herds	Sows	Produced pigs following year
	Number	Number	Per cent
Treated with serum and virus.....	181	2, 362	95.0
Not treated.....	148	1, 840	94.4

## TREATMENT OF YOUNG PIGS

Pigs may be treated with serum alone or with the simultaneous inoculation, regardless of age. If young pigs receive both serum and virus, the immunity, as a rule, is lasting, and only an exceptional herd or individual will then contract cholera. It is known that pigs from sows which passed through the disease before being bred rarely contract hog cholera during the suckling period, but after that time they are likely to become susceptible. Therefore if cholera should appear on the premises, such pigs should be treated in the same way as the remainder of the herd.

Although it has been repeatedly shown that very young pigs can be given lasting immunity by the simultaneous inoculation, it is probably also true that more careful discrimination is required than when the same treatment is applied to older hogs. This is because of the fact that young pigs are susceptible to many diseases and are

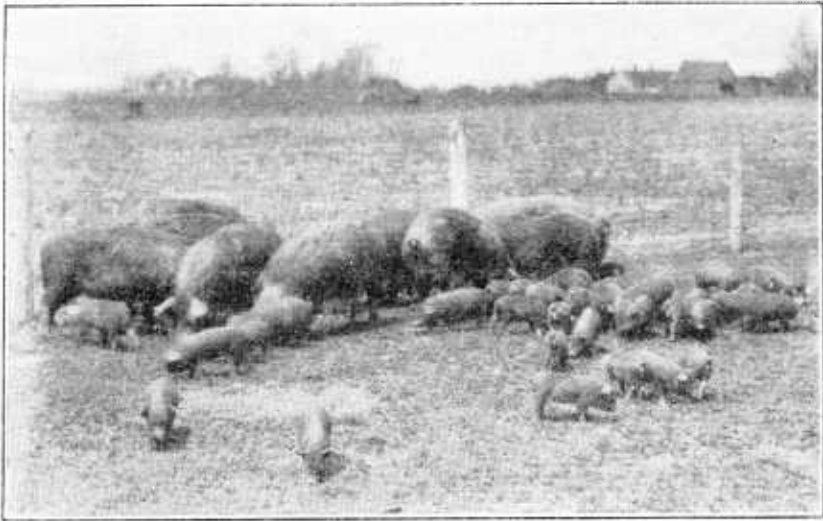


FIG. 11.—Immunized sows with their litters

more easily affected by adverse conditions than older hogs. In administering the simultaneous inoculation to young pigs it is therefore especially important to be sure that they are in good health at the time of inoculation. If the pigs are unthrifty from parasitic infestation, or in fact from any cause, if they show signs of thumps or other abnormal conditions, the simultaneous inoculation should be postponed until they are restored to complete health. In urgent cases in which the pigs must be immunized immediately, it is better to use serum alone if the pigs are not in good condition at the time. They can be given the simultaneous inoculation at a later date.

The immunization of suckling pigs has much to recommend it in the way of decreased cost and increased protection. By immunizing early, less serum is required, and the pigs are protected sooner. Since the successful immunization of suckling pigs does not necessitate the reduction of feed, it is possible that the practice would

enable farmers to market their pigs somewhat earlier than if the immunization were carried out after weaning.

### RESTOCKING AFTER AN OUTBREAK OF HOG CHOLERA

In some instances the infection of hog cholera disappears from premises within a few weeks, while in other cases it remains for months. The infection is more likely to be eliminated quickly in summer than in winter. This is probably caused by putrefaction and fermentation of infected material, as experiments have shown that the virus of hog cholera is usually destroyed by those processes. In the cold months of winter, putrefaction and fermentation do not take place, and infection persists for a longer time. No statement can yet be made of the exact time required for the elimination of infection on farms through natural agencies.

Sick hogs are a constant menace to nonimmune hogs; therefore susceptible hogs should not be placed on a farm so long as any sick hogs remain on the premises, nor should they be brought on to a farm where infection has existed until after the premises have been cleaned and disinfected. All old troughs, rubbish, litter, and other material that may be contaminated should be burned. As a general rule, the introduction of susceptible hogs on to previously infected farms can not be regarded as safe at any season within three months of the time the last sick hogs were removed unless in the meantime the premises have been effectually cleaned and disinfected. It seems advisable, as a means of precaution, to immunize new litters farrowed on the premises, and also new stock brought on to the farm within 90 days after all the sick hogs have recovered, and if possible new runways and feed lots should be provided.

### DRUG REMEDIES

No drug or combination of drugs is known at present that can be regarded as a preventive or cure for hog cholera in a true sense of the words. From time to time preparations appear on the market composed of drugs and chemicals which are advertised to protect hogs against cholera or to cure hogs affected with the disease. Many of these so-called cures have been tested by Federal and State institutions and have been found to be worthless as preventives or cures for hog cholera. Farmers therefore are warned against investing their money and placing their faith in hog-cholera medicines. "Anti-hog-cholera serum," prepared according to the methods originally worked out by the Bureau of Animal Industry, is the only agent known that can be regarded as a reliable preventive.

There are many so-called "tonics" advertised to do wonders for hogs, and some of them may have merits as condition powders. None, however, are of any value as a cure or preventive for hog cholera. The following formula has been used by farmers for a number of years and is probably as good as any other for a condition powder, but it will not serve to cure or prevent cholera:

	Pounds
Wood charcoal.....	1
Sulphur.....	1
Sodium chloride.....	2
Sodium bicarbonate.....	2
Sodium hyposulphite.....	2
Sodium sulphate.....	1
Antimony sulphide (black).....	1

These ingredients should be mixed thoroughly and given with the feed in the proportion of a large tablespoonful to each 200 pounds' weight of hogs not oftener than once a day. Salt poisoning is sometimes produced by mixing overdoses of salt with the feed. Salt should be placed separately where the animals can help themselves at will.

### CONCLUSION

The end in view in combating hog cholera is the ultimate elimination of the disease, though at present it seems wiser to consider control rather than eradication.

Experiments of the Bureau of Animal Industry have demonstrated the possibility of greatly reducing the losses from hog cholera whenever farmers are willing to cooperate and take steps to prevent the spread of infection and secure the proper treatment of their herds.

Permanent reduction in losses from cholera can be expected only when farmers organize in a determined effort consisting principally of self-imposed quarantine, the continuous observance of sanitary precautions, and the early use of the serum treatment, should the herd become infected or dangerously exposed.

It is important that competent veterinarians, or trained laymen where there are no veterinarians, be employed to administer the treatment and that cooperation and support be given to any movement by State or Federal authorities for the control of hog cholera. If farmers will not unite in this way, the best possible results can not be expected.

The United States Department of Agriculture does not prepare anti-hog-cholera serum for sale or distribution. For information as to where serum may be obtained and the help that may be had in combating hog cholera, write to the Bureau of Animal Industry, United States Department of Agriculture, Washington, D. C., or the State veterinarian, livestock sanitary board, or State agricultural college in the State where you reside. It is advisable to consult your local veterinary practitioner immediately when a suspicious disease appears in your herd.

## FACTS ABOUT HOG CHOLERA

### TO AVOID HOG CHOLERA

**L**OCATE hog lots and pastures away from public highways, and, unless they have been immunized, do not allow hogs to run on free range or highways, nor to have access to canals or irrigation ditches.

Do not visit a neighbor's farm nor allow him to visit yours if there is hog cholera on either place.

Do not drive into hog lots after driving on public highways.

Do not use hog lots for yarding wagons and farm implements.

Do not place newly purchased stock, stock procured or borrowed for breeding purposes, or stock exhibited at fairs immediately with your herd.

Keep such stock quarantined in separate pens for at least three weeks, and use care in feeding and attending stock to avoid the possibility of carrying infection from these to other pens.

Burn to ashes or cover with quicklime and bury under 4 feet of earth all dead animals and the inedible viscera removed from animals at butchering time, because they attract buzzards, dogs, etc., which may carry hog-cholera infection.

If hog cholera appears in the neighborhood, confine your dog and encourage your neighbor to do the same.

### TO COMBAT HOG CHOLERA WHEN IT APPEARS

Have all hogs immunized against cholera immediately as described in this bulletin, after which they should be kept on a light diet for a short time. An abundance of pure drinking water should be supplied, and the treated hogs should be kept in clean, sanitary quarters.

To obtain the best results the treatment must be administered as soon as the disease can be detected in the herd. Be sure that the temperature of all hogs is taken. A temperature above 104° F. in ordinary weather and when the animal is not excited indicates disease and the necessity for an increased dose of serum.

### TO RID PREMISES OF INFECTION

Remove the manure from the infected pens and yards and spread or place it in piles where it is not accessible to swine.

Burn all litter, rubbish, and old hog troughs. Keep hogs away from old straw stacks.

After the premises are thoroughly cleaned, spray walls, floors, and other surfaces with a recognized disinfectant. Scrub hog troughs with hot water. Where hog houses are small, turn them over, exposing the interior to sunlight. Mud wallows and cesspools should be filled in, drained, or fenced off.

All runs underneath buildings should be cleaned and disinfected and then boarded up to keep hogs out.

Destroy hogs that do not fully recover, as they may be carriers of cholera infection.

## **IMPORTANT FACTS ABOUT THE SERUM TREATMENT**

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**THE SIMULTANEOUS (VIRUS-SERUM) INOCULATION GIVES HOGS A LASTING IMMUNITY AGAINST CHOLERA.**

**THIS TREATMENT CONSISTS IN IN-  
OCULATING THE HOG WITH A SMALL  
AMOUNT OF THE VIRUS AND AT THE  
SAME TIME INJECTING A PROPER  
DOSE OF ANTI-HOG-CHOLERA SERUM.**

**AMPLE DOSES OF GOOD SERUM AND  
VIRUS PROPERLY ADMINISTERED ARE  
NECESSARY FOR SUCCESS.**

**THE TREATMENT SHOULD BE GIVEN  
BY COMPETENT VETERINARIANS.**

**SERUM-ALONE TREATMENT GIVES  
TEMPORARY PROTECTION, USUALLY  
LASTING ONLY TWO TO SIX WEEKS.**



# **ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE**

November 21, 1928

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